EVALUATION OF A VEGETABLE PREPARATION TRAINING PROGRAM: PART I: DEVELOPMENT OF TRAINING PROGRAM AND ASSESSMENT OF TIME-TEMPERATURE DATA

by

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INTRODUCTION

The service of high quality food is a primary goal of the school foodservice system. Quality encompasses not only the microbiological and nutritional attributes of food but also sensory quality dependent on texture, temperature, and appearance of the product. A major factor in sensory quality is a result of improper production scheduling (1, 2, 4). Reduction in holding time could be best accomplished by training employees.

Training in modern foodservice is a rapidly developing and important means to assist employees in functioning effectively and also enables the foodservice industry to produce quality food items (4). Training, as defined by Forrest (5), is the process of acquiring and developing skills, knowledge, and attitudes through instructional activities. It is performance-based, focuses on achieving goals that are believed to be attainable through improved performance, and is the process of developing qualities in human resources that ultimately enable employees to be more productive.

Results of a study by Johnson (6) indicated that long holding times for both vegetables and entrees affect quality of food. A sequel to the Johnson study by Rieley et al. (7) suggested that variability in food quality may result from the use of improper preparation techniques and recommended additional research to determine if training could improve techniques, and thus improve quality of food.

Based on the Rieley et al. research (7), this study was devised in two concurrent parts to evaluate the effectiveness of an employee training program as a means of improving quality of cooked vegetables in school foodservice. Specific objectives of this study, part one, are:

- to assess time/temperature relationships and holding times of cooked vegetables at five elementary schools,
- to conduct training programs, on batch cooking of vegetables, and
- to assess effectiveness of training on temperatures and holding times of cooked vegetables.

Objectives of part two of the concurrent study by Devan (8) are:

- to assess the influence of vegetable preparation training on the amount of vegetable plate waste,
- to compare student ratings of cooked vegetables before and after training of the cooks, and
- to determine if quality characteristics of cooked vegetables, as measured by a professional sensory panel, are affected by proper training in vegetable preparation techniques.

Definitions

The following definitions are used in this research.

- Conventional system - food is prepared and served in the same facility.
- Satellite with finishing kitchen - some food products are prepared in a central kitchen and transported to this variation of the satellite system. A convection oven and steamer are in these kitchens to be used for preparing food products that do not transport well, e.g. vegetables.
- Holding time - the time period that vegetables were held prior

to service. It is the time lapse from end of production to start of service.

- On-site training - training given to foodservice employees in their facilities.
- In-service training - training given to a group of foodservice employees in a conference room.
- Positive reinforcement - praise given by superiors, school principals, and researcher to enhance and encourage learning.

REVIEW OF LITERATURE

The literature reviewed in part one of the total study will consist of only those references pertinent to time and temperature effects on food quality and employee training. The National School Lunch program, acceptability ratings for school lunch, and sensory evaluations are reviewed in part two of the study (8).

Time/Temperature Relationship

Allington et al. (9) conducted a study in 14 randomly selected nursing homes in Wisconsin. Ten characteristics of quality in food and foodservice were identified and divided into the following three categories:

- Food preparation - appearance, flavor, texture, and temperature;
- Foodservice - meal appearance, meal accuracy, and meal delivery or service times; and
- Sanitation and safety - equipment, kitchen areas, and foodservice personnel.

Results indicated temperature abuse of food was the most critical quality problem followed by late delivery of meals. The recommendation was that supervisors establish standards for sanitation and safety of foodservice operation (9).

Brown et al. (10) conducted a study to determine existing conditions, procedures, and practices relating to storage, preparation, handling, transportation, and service affecting quality of food in school foodservice systems. Time and temperature were recorded at the beginning and end of preparation, transportation, and service of 20 entrees served in satellite units. Total time from end of production to end of service exceeded two hours. Internal temperatures of nine of the 20 entrees were between 45°F and 140°F. In some instances, the entrees were held within the danger zone for almost two hours after preparation. Rini et al. (11) also found that after holding beef loaf portions during transportation in insulated trays for one or two hours, none of the temperatures were 60°C or above the recommended level.

Johnson (6) conducted a study to determine food acceptability in school foodservice with on-site preparation and service and satellite service centers. Temperature of entrees and vegetables were taken at the end of food preparation, beginning of transportation, arrival at service site, beginning of service, and end of service. In most cases, temperature of vegetables remained above 140°F. On the average, mean temperature of half of the entrees for satellite schools was below 140°F. The total holding time from end of production to end of service for vegetables and entrees ranged from one to three hours. Poor color, overcooking, and mushiness affected quality of vegetables at the satellite schools.

Hill et al. (12) affirmed hot-holding of vegetables is detrimental to quality and recommended that vegetables be served immediately after cooking with not more than 30 minutes of holding. Bengtsson and Dagersbog (13) also reported hot-holding effectively destroys sensory quality of food products that have been prepared after a careful choice of raw materials, processing, and storage.

Klein et al. (14) reported time and temperature relationships were involved in five of the six major factors contributing to outbreaks of foodborne disease in the United States from 1961 through 1976. The authors suggested the data emphasized the importance of devising methods for maintaining and controlling food safety and quality at critical points throughout the food flow process. Tools for effective monitoring include standardized procedures, initial and end-heating temperature controls, microbial controls and appropriate training procedures.

Rieley et al. (7) compared conventional, satellite with finishing kitchen, and complete satellite delivery systems. Large deviations in time-temperature were found within each school and between types of system, thereby potentially masking differences between the three systems. Rieley suggested variability may have resulted from improper preparation techniques. The finishing kitchens were not used in accordance with the design purpose. A recommendation was for specific training of employees in the proper use of a finishing kitchen in a satellite system.

Effect on Nutrients

Head (15) investigated in a two phase study nutrient losses during preparation, distribution, and service in school kitchens. In phase I, losses of nutrients occurring during transportation of foods in insulated carts were measured at the beginning and end of transport. In phase II, nutrient losses from individual menu items were measured immediately after preparation and during service. A significant loss of ascorbic acid was observed after preparation and a consistent decrease in iron levels during the transportation and holding interval.

Jansen et al. (16) also measured nutrient levels from preparation through service in nine food items served in sixteen high schools. During food preparation, holding, and service, thiamin was significantly lost in chicken, fish sticks, and peas. Vitamin C was significantly lost in peas; riboflavin, carotene, and vitamin A were well retained in all food items.

Prusa et al. (17) determined ascorbic acid, thiamin, and vitamin B_6 content of three vegetables: broccoli, green beans, and peas; and the same nutrient analysis was conducted on three entrees: pizza, breaded fish fillets, and turkey and noodles. Vitamin content of food items prepared from on-site, central, and satellite kitchens was measured. The result indicated no differences among schools for ascorbic acid, thiamin, and vitamin B_6. A significant vitamin loss was indicated from broccoli and peas at the satellite school. The authors recommended frozen vegetables be prepared on-site and not be transported from the central kitchen whenever possible.

Lee et al. (18) conducted a study to determine the effects on the thiamin retention of oven-baked chicken of different heating and holding processes involved in the conventional cafeteria-style foodservice system. Thiamin determinations were made on repeated samples of raw, cooked, hot-held, and frozen-cooked chicken. Steam table holding for 90 minutes resulted in evaporation loss. No significant differences were observed in thiamin content after various treatments when compared to that of freshly cooked chicken.

According to Snyder and Matthews (19), hot-holding is detrimental to the vitamin C content of whipped potatoes. Dehydrated potatoes were reconstituted, mixed, transferred to a pan, and held hot for 60 minutes. Significant interactions were found between temperature and vitamin C loss. The authors suggested whipped potatoes should not be relied upon to contribute the consumer's vitamin C requirement.

Jacobi and Setser (20) compared spaghetti prepared by both foodservice and household procedures. Results indicated household quantities and methods and temperatures of 185°F resulted in greater losses of thiamin than did foodservice quantities and methods and temperatures of 165°F. The authors recommended that hot-holding which results in temperature fluctuations should be avoided to retain these nutrients.

Effect on Sensory

Cremer and Chipley (21) determined time and temperature conditions including microbial and sensory quality of food during various phases of product flow and after product storage times which occur in actual foodservice operations. The mean temperature during holding and assembly remained within the accepted range. Data indicated a definite quality advantage for freshly prepared products.

Rini et al. (11) assessed sensory and microbiological qualities of beef loaf in four commissary foodservice treatments. On the first and second treatments, the beef loaf portions were transported in insulated plastic trays, and held for one or two hours prior to service. The third treatment consisted of portioning the beef loaf into foil containers, chilling, and holding for 24 hours prior to heating in a convection oven. The fourth treatment consisted of chilling, holding in bulk, heating and holding portioned beef loaf for one hour. Sensory evaluation scores indicated general acceptability for hot beef loaf portions held one hour scored significantly higher than portions held two hours or chilled for 24 hours and heated in a convection oven. No significant difference was observed for portions held one hour prior to chilling and for those chilled 24 hours, heated, and then held for one hour.

Bengtsson and Dagersbog (13) determined that more than two hours of hot-holding greatly reduced the sensory quality of beef slices and patties in a cook/freeze system. Al-Obaidy and Klein (22) compared sensory quality of freshly prepared spaghetti with meat sauce to that held hot on a cafeteria counter. Immediately after preparation, the product was placed on a preheated counter table for 90 minutes at approximately 66°C. Thermocouples were placed at nine different locations in the pan of spaghetti during holding. Time and internal temperatures of spaghetti and meat sauce in various phases of product flow were recorded soon after preparation. A steady decline in temperature was noted for the first 30 minutes of holding. On an average, a 10 percent decrease occurred in the internal temperatures within 90 minutes of steamtable holding.

Jacobi and Setser (20) determined the sensory quality of spaghetti prepared by both foodservice and household procedures. Length of holding time resulted in significant changes in all sensory characteristics: clumping, firmness, mouthfeel, and moist appearance.

They concluded lengthy hot-holding periods allowing food to reach high internal temperatures are not recommended for presentation of quality products. If foodservice employees must hot-hold spaghetti with meat sauce, a low temperature and short time are recommended to minimize textural changes in the spaghetti.

Rieley et al. (7) evaluated the sensory quality of broccoli, tater tots, and chicken nuggets prepared in conventional, satellite with finishing kitchen, and complete satellite systems. An expert panel, professionally trained in sensory analysis, evaluated the three food items for quality characteristic; i.e., moistness, tenderness, and coating crispness of chicken nuggets; color and firmness of broccoli; and crispness of tater tots. No significant differences were found between the systems. A high degree of variability of scores from one data collection to another was noted in all schools which may be attributed to a variation in product within each school and between schools. Rieley concluded that variability may have resulted from the use of improper preparation techniques and suggested training of employees was indicated.

Training

Training in school foodservice is a requirement according to Public Law 91-166 (23). The law includes the statement that many school foodservice personnel have not had adequate training in management skills and principles, and many teachers and foodservice operators have not had adequate training in the fundamentals of nutrition or how to convey this information to motivate children to practice sound eating habits. Congress provides funds to educate and train school foodservice personnel.

Gines and Schweitzer (1) discussed training as an integral part of the operation of a foodservice facility and indicated training is rapidly developing and gaining in importance. To ensure the success of a training program, the manager should determine objectives and delegate responsibility to concerned and able individuals. The objectives should be used to evaluate the success of the training program. Proper follow-up procedures must be initiated to ensure training is coordinated, continuous, comprehensive, and successful. The role of the administrative dietitian must often be that of a training dietitian. Other studies (4, 24) have acknowledged training in foodservice as a way to improve work performance, educate individuals and groups to interact effectively, keep skills up to standards, and alleviate discrepancy between actual and desired skills.

Salter and Knight (25) reviewed the basic parts of employee training programs which are goal-setting, evaluation, and reinforcement. Training should begin by emphasizing goal-setting to provide direction and motivation and should be done by participating employees rather than management; goals should be specific and achievable. Evaluation on a regular schedule is possible when specific and measurable goals have been selected. The authors emphasized the importance of the manager in coaching and encouraging employees as well as reinforcing them whenever possible. They recognized paying a bonus to an employee every time a good job is performed is probably not feasible, but providing intangible reinforcement in the form of praise, attention, or respect is desirable.

In-service

According to Jernigan (3), in-service education programs should be planned and conducted for the development and improvement of skills of all facility personnel and include on-the-job training. In-service training can often serve as a method of solving a problem or improving employee knowledge and must be planned within parameters of the need for training (4). Facilities should have plans that include goals and objectives for ongoing in-service education.

Mier (26) surveyed 70 hospitals to determine how in-service education programs are organized and administered, components of orientation programs, types of media used, and problems associated with training programs. Ninety percent of the hospitals indicated use of a formal in-service education program, in which the average employee attended thirteen sessions a year. In most of the institutions, training responsibilities were delegated to hospital personnel who had other primary duties. Classes were taught by dietitians, supervisors, in-service coordinators, guest speakers, and other hospital staff. Study results indicated that up to 76 percent of the employees had problems with scheduling time to attend training sessions. Food preparation, meal service, and sanitation are tightly scheduled resulting in little time for conducting training.

DeHoger et al. (27) conducted a study to determine the best time of day to instruct foodservice technicians. They found that morning instruction produced greater mean difference pre and post test scores than at any other time.

Nelson (28) compared lecture and discussion and individual instruction for hospital foodservice employees on personal hygiene, knowledge retention, and cost effectiveness. Ninety-five foodservice employees from five Oregon hospitals participated in the study. Comparison between the methods revealed no significant differences in knowledge retention of the subject matter.

Orientation

Puls et al. (29) developed an orientation program for foodservice employees in a large medical center and evaluated its effectiveness in terms of job satisfaction, job performance, and labor turnover. They concluded the orientation program increased job satisfaction and lowered labor turnover.

An orientation program was developed by Reed (24) for newly hired substitute hospital foodservice employees, and effectiveness was measured in terms of job satisfaction, job performance, and labor turnover. Employees were given orientation and training during the first week of employment and a follow-up during the second week. During this time, training included sanitation, safety, food handling, and work attire. These newly hired substitute employees were compared with a control group which consisted of both newly hired employees and those hired during a four month period prior to the study. The orientation and training program included reading material, filmstrips, demonstrations of equipment, and tours to familiarize employees with their new job. Job satisfaction among the experimental group was higher than the control group of full-time employees. The group with the initial training scored higher in work performance, personal appearance, and equipment use than those who did not receive orientation and training.

An orientation program is designed to provide new employees with information they need to function comfortably and effectively in the organization (30). According to Spears and Vaden, three types of information are included in orientation.

- Review of the organization and how the employee's job contributes to the organization's objectives.
- Specific information on policies, work rules, and benefits.
- General information about daily work routine.

On-the-job Training

According to Avery (31), on-the-job training is frequently done by an employee. A new employee is assigned to work with a skilled one who devotes time to teaching details of various tasks which are required on the job. One potential weakness of on-the-job training is that it is often taught by a fellow employee who knows little about the fundamentals of training.

Avery (31) presented the following six training procedure steps that could be used in foodservice institutions.

- Prepare a job description and job analysis for each job.
- Eliminate those tasks and duties that the new employee knows.
- Provide a unit training sheet with breakdowns of what is to be demonstrated or performed in the sequence that is to be followed.

- Prepare items needed for training such as notes, handouts, food, materials, equipment and training aids.

- Give the trainee an opportunity to perform sequences.

- Allow the employee to practice the new task without supervision.

Tiener (32) conducted a study to develop and implement an on-the-job training program based on the job analysis of part time hospital tray-line employees to determine productivity and employee satisfaction. Eleven part time tray-line employees received the on-the-job training program. Productivity was measured by calculating number of minutes per meal, percentage distribution of work activities using a work sampling study, and number of trays assembled per minute before and after training. Employee satisfaction was measured by turnover rate, Job Description Index, and training attitude. Significant differences were noted in the number of trays assembled per minute and the percentage distribution of time spent in forced delay. Number of trays assembled decreased significantly and percentage distribution of time spent in forced delay increased which was not expected by the researcher. Analysis of data used to measure the effects of on-the-job training indicated that variables other than training affected the components of productivity.

Forrest (5) defined skill or on-the-job training as that in which employees learn how to do the work for which they were hired. Advantage of on-the-job training is that it is the least expensive method to implement and requires no special training. The trainee receives immediate feedback on job performance from the trainer and has an instant opportunity to practice what was taught. A careful orientation program reduces costly mistakes and anxieties and helps create realistic job expectations (30).

On-the-job training, according to Spears and Vaden (30), includes job rotation, internships, and apprenticeships. In job rotation, employees are assigned to work on a series of jobs over a period of time allowing learning of a variety of skills. In an internship, a combination of classroom instruction and job training is given; in an apprenticeship, a highly skilled co-worker is responsible for employee training.

Positive Reinforcement

Eason (33) conducted a study to ascertain if sanitation practices of a group of foodservice employees could be improved by a feedback system using behavior modification techniques. The feedback and training system was compared to a standard training program using a lecture and slide series. Employees were observed during 30 three-hour work periods. The 30 observation periods were divided into six five-day treatments.

- Baseline--camera, videotape, recorder, and observer were added to regular environment.
- Handwashing--employees were informed that the camera was for the purpose of studying handwashing.
- Sanitation Training--a 30 minute lecture with a slide session was shown to prompt handwashing following the seven antecedents.
- Follow-up I--same environment as baseline.
- Individual Feedback--the employees were shown the occurrence frequency of the antecedent behaviors and of subsequent handwashings.
- Follow-up II--same environment as baseline.

Individual feedback produced the greatest increase in handwashing following the antecedent behaviors. The author concluded handwashing practices could be improved more by a feedback system utilizing behavior modification than by a training program using a lecture and slide series.

Zacarelli (34) discussed the importance of explaining to employees why a specific task is important. He emphasized that training should be geared to the individual's learning ability and reinforcement to employees is essential. Jernigan (4) stated employees want to be respected as living, breathing persons and are usually more interested in learning if their efforts are recognized. She discussed that recognition for a job well done is one factor in making a training program a success.

Cherrington and Wixom (35) emphasized that recognition is the top motivator. They discussed the theory of motivation and classified it into three categories: need, reinforcement, and expectancy. All three rely on rewards or reinforcement for effectiveness. They advised managers to appreciate the importance of recognizing new employees as it plants the seeds for success.

Forrest (5) considered feedback as coaching which was defined as constant reinforcement of learning acquired through training. Through coaching, an employee is challenged, encouraged, motivated, and reinforced to apply new learning. He emphasized that employees have a need for feedback about their performance. Even though they have performed the same task correctly for many years, they still want to hear the manager and co-workers express approval of their work.

McCarty (36) conducted and investigated how self-confidence of men and women is affected by receiving some form of feedback. Three groups, including a control group, received either positive or negative feedback. A total of 114 men and 62 women undergraduate students were asked to perform a task on which they would develop unusual uses for some common objects. They would have five minutes to work on each of three tasks and their answers would be compared to other participants and would be evaluated for both quantity and quality of ideas; quality would have the greater weight. The control group was told their performance results would not be available until the following day. The experimental group received coded computer results at the end of each work period. Some of the group received positive feedback from high scores; the other group received negative feedback from low scores. Results indicated that self-confidence levels of men and women were not equal and these differences existed even when both received identical cues about performance. Both men and women responded to positive feedback by increasing performance expectancies and to negative or no feedback by lowering performance expectancies. Data from the negative feedback condition demonstrated that unfavorable results depress the self-confidence scores of both men and women. McCarty concluded evaluation of behavior and performance is essential to all employees and especially for women who need to be provided with opportunities to foster the same kind of confidence that men display.

Training Effectiveness

Acacio (37) compared a self-instructional program with group training for foodservice personnel. Both methods were found to be equally effective for training foodservice employees in nutrition, type A-lunch, and menu making. Employees with low pretest scores gained significantly greater job knowledge than those with high pretest scores.

Rinke et al. (38) determined the effects of training and related factors and also compared live and taped instruction for training foodservice personnel. The score or knowledge gained from the two methods was not significantly different. Participants with higher education gained more from live, and those with less education gained more from taped instruction. The authors concluded that live and taped instruction were equally effective for training food production employees.

A two part study was conducted by Winter (39) to determine the effects of a foodservice sanitation training program, compare results with a similar study, and determine how much information learned in the training program was transferred to on-the-job work situations. Part one consisted in implementing a sanitation training program and included pre and post training on-site visual assessment. Part two was the comparison of results with those of a similar study. Results indicated training programs were not effective in improving restaurant sanitary conditions and practices.

DeHoger et al. (27) conducted a two phase study. Phase one was to teach foodservice technicians and determine the best time of the day to instruct and best type of instruction. In phase two, the effectiveness of the instructor was evaluated. Results indicated morning instruction was better than afternoon. Group instruction produced the greatest mean difference score in the pre and post test.

Rivas and Canter (40) conducted a research project to determine the effectiveness of telenet, a telephone communication network, as a method of training school foodservice personnel. A total of 185 participants were pre and post tested and significant increase in scores was disclosed. When the same test was given to participants two months after completion of the course, results indicated a significant decrease in retention of subject matter. The authors concluded that training by telenet is effective but should be reinforced with in-service training shortly after the telenet course to raise the level of retention.

McProud et al. (41) suggested a non traditional approach to training for school foodservice employees who had previously not participated in voluntary training programs. The study was conducted to determine if knowledge of basic skills of foodservice assistants could be improved by using modules on sanitation, safety, and nutrition. Two series of ten three-hour modules were designed as a package for a one credit hour course at community colleges. The mean post test score of foodservice assistants, who completed the modules, was significantly higher than for those who had not.

METHODOLOGY

Research Sites

Based upon the recommendations of Rieley et al. (7), a research project was conducted to investigate time-temperature relationships in vegetable preparation and service and to evaluate effectiveness of a training program in five elementary schools located in a midwestern city. Currently, the district utilizes three types of foodservice delivery systems, namely conventional, satellite, and satellite with finishing kitchen. Only conventional and satellite with finishing kitchen were selected for this study. Two of the schools, A and D, have conventional food delivery systems and three, B, C, and E, are satellites with finishing kitchen.

All five school foodservices are under the supervision of a district director who gave enthusiastic support to the project. The director prepares basic menus one month in advance and to assist this project included frozen vegetables for the scheduled days. In most cases, kitchen managers were responsible for the vegetable preparation. All vegetables in the five elementary schools were cooked in steamers. In four of the schools, vegetables were served with entrees from a heated table and in the other school, the pan of vegetables was placed in the unheated salad bar with items such as fruit, bread, and condiments.

Research Design

Frozen vegetables were sent from the central kitchen to all schools one day before preparation and stored in the kitchen refrigerators or freezers until the following day when they were panned and either held in the refrigerator or at room temperature until steamed. Two graduate students assigned to the project visited each of the five schools and observed production techniques on four days within a four week period. The frozen vegetables were broccoli, corn, french cut green beans, mixed vegetables, peas, and spinach. Data on temperature and holding time were recorded on a specially designed form.

The data from the majority of the schools indicated that serving temperature was below the required 60°C level, and vegetables were held as long as two hours. The decision was made to develop a training program for cooks as a means of securing vegetables served at a safe temperature and decreasing holding time. A program consisting of one in-service and three on-site group trainings for the vegetable cooks was conducted by the researcher. Cooks in three randomly selected schools received positive reinforcement for performance after training. Data for assessment of training were collected on four non-consecutive days as in the original data collection.

Project Approval

The complete project including assessment of quality of vegetables and subsequent training of cooks was reviewed by the College of Human Ecology subcommittee on research involving human subjects and considered to be exempt from human subject review as stated in Federal regulation 45 CFR 46. The project was originally conceived as consisting of two phases, first the assessment of quality followed by training of cooks if justified. For strategic purposes, only the first phase was disclosed to the school authorities. The intent was to assure that cooks in anticipation of a forthcoming training program would not perform in a normal manner. In compliance with the known policy of the School Board requiring approval by the Dean of the College of Education for any projects involving the district schools, a letter requesting approval was sent to the Dean. A copy was sent to the District Superintendent of Schools with a cover letter requesting approval of the project (Appendix A). The Dean, by letter to the Superintendent, recommended favorable consideration of the project (Appendix A), and approval was granted. A similar procedure was followed for the training phase of the project and approval was granted (Appendix B).

Phase I: Assessment of Quality

Data Collection Form

The data recording form was designed specifically for this project. The researcher and two graduate assistants tested and evaluated the form at two elementary schools. The form was modified to include holding time prior to service and between service periods (Appendix C). Information on the number of boxes of vegetables cooked and the number of servings left after service was added.

Pre-training Data Collection

Vegetable preparation was observed in the five schools; one graduate assistant was assigned to two conventional kitchens and the other to three satellites with finishing kitchens. A data collection schedule was prepared and distributed to the foodservice director, principal, and foodservice employees in each of the schools (Appendix D). Each was visited four times in a four week period, making a total of 20 observations. The data collection days were Monday, Tuesday, Thursday, and Friday but not in the same week. To avoid bias, the days of observation were not duplicated at any schools. During each of the data collection visits, the procedural schedule of the cooks was observed in order to determine the possibility of corrective measures.

In addition, temperatures were taken using a pocket thermometer having a range of -20 to 105°C. Temperatures were recorded on the observation form at start of cooking, finish of cooking, start of service, and end of service. If the same batch of vegetables was used a second time, observations were recorded at the start and end of the second service.

The holding time for a pan of vegetables was defined as that from end of production until start of service. If the same pan of vegetables was used for the second service, the time held between service periods also was recorded.

Phase II: Development of Training

Inspection of the data collected in Phase I indicated serving temperatures at most of the schools were below 60°C and holding time ranged from 5 to 120 minutes confirming the findings of previous studies by Johnson (6) and Rieley et al. (7). The observations in Phase I supported the initial opinion that a training program would be essential. The researchers met with the foodservice director to review the data and present a proposal for a training program on vegetable preparation (Appendix E). The proposal included the schedule for the in-service group training session and the on-site training sessions and, also, objectives for the training program.

The district foodservice director supported the proposal and gave approval to conduct the training program. A copy of the training program and a request for continuing education hours were mailed to the participating schools (Appendix F).

The training program consisted of group in-service and on-site elements. In-service training was given to all district school foodservice employees during the regularly scheduled annual meeting. After in-service training, two on-site training sessions and one follow-up observation were made in each school. The follow-up session was for critical observation and answering questions.

In-service Training

A group in-service training program approved by the American School Food Service Association (ASFSA) for one hour of continuing education credit was presented to approximately 60 employees. The objectives of the in-service sessions were:

- to gain understanding of nutrient loss in cooking and holding
- to appreciate the importance of time and temperature relationships
- to learn advantages of batch cooking methods for vegetables

Handouts outlining the key topics of the presentation (Appendix G) were distributed. The in-service training lasted approximately 40 minutes and included the following information:

1. Summary of Johnson study (6) which compared consumption and acceptability of entrees and vegetables prepared on-site and in satellite kitchens.
2. Summary of Rieley et al. study (7) which compared food quality produced in conventional, satellite with finishing kitchen, and complete satellite systems.
3. Summary of data on time/temperature relationships and holding time of cooked vegetables.
4. Discussion of foodservice delivery systems; i.e. conventional, satellite, and satellite with finishing kitchen.
5. Principles of vegetable quality
    - Importance of preserving color, texture, and nutrient value
    - Relationship of holding time, nutritional value, and sensory quality
    - Necessity of monitoring temperatures for reasons of public health and microbiological safety.
6. Principles of batch cooking as applied to vegetable preparation
    - Prepare only amount needed for a single service
    - Cook close to service time
    - Use appropriately sized pans; i.e., half pans instead of full, two inch pans instead of four inch.

7. Group exercise in batch cooking.
    - Calculate the quantity of vegetable for a single service to a given number of pupils.

On-site Training

Individualized on-site training was conducted with the vegetable cooks in five elementary schools. Employees received six hours of continuing education credit from ASFSA. The objectives of the on-site training sessions were:

- To reinforce cooking principles presented at the in-service session,
- To emphasize batch cooking techniques for reduction of holding time, and
- To relate holding time to the "danger zone" for microbiologic control.

Before the first on-site training session, the researcher met with the employee responsible for cooking vegetables in each school to discuss production and service schedules, and how techniques from the in-service training session could be incorporated in daily routines. The researcher, with the vegetable cook, developed a work schedule coordinating cooking with other duties in an effort to minimize holding time and increase serving temperature.

On the first day of on-site training in each kitchen, the researcher demonstrated batch cooking techniques using available equipment, and also showed the proper procedure for taking temperatures of vegetables throughout production and service. On the second day, the cooks prepared the vegetables by the batch method under observation by the researcher. The cooks followed the schedule previously developed including checking temperatures and minimizing holding time before service. The researcher followed up the training sessions by returning to each of the schools to observe and answer any questions the vegetable cook might have. During this visit, the researcher reviewed quality standards for cooked vegetables and principles and procedures of batch cooking.

Post Training Data Collection

After the training sessions, data were again collected on time/temperature relationships and holding times. The collection procedure for 20 observations was identical with that used for pre-training data.

Positive Reinforcement

One of the objectives of this study was to assess the impact of using positive reinforcement techniques in the training program. Cooks from three of the five schools were selected to receive positive reinforcement in addition to the training program. The reinforcement consisted of commendation to the cooks by the district foodservice director for a job well done. The principals also praised the cook on the appearance of the vegetables. The researcher expressed appreciation for the performance of the cooks and presented pin-on buttons imprinted "Number one vegetable cook" (Appendix H).

Data Analysis

Demographic data were analyzed by frequency distribution. The statistical analysis of this research was based on the split-plot design. Since data were unbalanced, techniques described in Milliken and Johnson (44) were used for analysis. This required using the General Linear Model (GLM) procedure in Statistical Analysis System (SAS) as described by Milliken and Johnson. Serving temperature and holding time for the first service and also the second service was analyzed. GLM was used to estimate means and standard errors for each variable.

RESULTS AND DISCUSSION

This investigation pertained to time temperature relationships and holding of cooked vegetables in conventional and satellite with finishing kitchen school foodservice systems. Data originally indicated a need for training of cooks to achieve more satisfactory and uniform products. These data are identified as pre-training, and data collected afterward as post training.

Vegetable Preparation

Cooking Equipment

The five elementary schools in the study were equipped with three types of steamers for cooking frozen vegetables. Schools B, C, and E used pressure steamers at five pounds (lb) per square inch (psi) and school D at 15 lb psi; school A used a pressureless convection steamer. Vegetables were cooked in either full (12 × 20 inches) or half (12 × 10 inches) size counter pans in either 2, 4, or 6 inch depth.

Cooking Time

Cooking time for the vegetables is shown in Tables 1-3. As expected, the mean cooking time varied depending on the type of steamer used; e.g., shortest times using the 15 lb psi pressure steamer (Table 1). Users of 5 lb psi pressure steamers (Table 2) appeared to have decreased cooking time after training; cooking time using a 15 lb psi pressure steamer (Table 1) or convection steamer (Table 3) remained approximately the same. The quantity of vegetable

Table 1. Mean cooking time pre- and post training[1] for different types of vegetables using a 15 lb psi pressure steamer at school D

data collection	vegetable	number of pans	mean cooking time in minutes
			mean standard error
pre-training	broccoli	10	5 ±0.40
	mixed vegetables	10	6 ±0.74
post training	broccoli	9	6 ±0.57
	lima beans	4	5 ±0.00
	mixed vegetables	3	5 ±0.67

[1] Four observations for pre-training and four for post training.

Table 2. Mean cooking time pre- and post training[1] for different types of vegetables using 5 lb psi pressure steamers at schools B, C, and E

data collection	vegetable	number of pans	mean cooking time in minutes
			mean standard error
pre-training	broccoli	5	19 ±0.55
	corn	3	25 ±9.50
	corn on the cob	4	32 ±2.36
	french cut green beans	2	17 ±1.00
	mixed vegetables	9	26 ±2.13
	peas	6	17 ±1.12
	spinach	4	29 ±3.20
post training	broccoli	14	13 ±0.71
	corn	12	13 ±0.40
	mixed vegetables	4	18 ±1.31
	peas	5	10 ±1.36
	peas and carrots	2	14 ±2.50
	spinach	2	13 ±0.50

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[1] Four observations at each school for pre-training and four for post training.

Table 3. Mean cooking time pre- and post training[1] for different types of vegetables using the convection steamer at school A

data collection	vegetable	number of pans	mean cooking time in minutes
			mean standard error
pre-training	corn	3	26 ±5.33
	mixed vegetables	3	12 ±0.00
	spinach	4	31 ±1.44
post training	corn	3	23 ±3.33
	mixed vegetables	3	21 ±4.93
	peas	4	13 ±1.22
	peas and carrots	4	12 ±1.19

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[1] Four observations for pre-training and four for post training.

cooked in each pan decreased in some schools after training which might explain some of the reduction in cooking time.

Type Prepared

The number of times each vegetable was served on the menu during data collection pre- and post training is shown on Table 4. Mixed vegetables, broccoli, and spinach were most frequently served during pre-training; whereas, post training observations indicated broccoli, peas, and corn were most frequently served.

Table 4. Number of times vegetable served pre- and post training[1]

vegetable	pre-training	post training
	← number of times served	→
broccoli	4	6
corn	2	4
corn (cob)	1	0
french cut green beans	1	0
mixed vegetables	6	2
peas and carrots	0	2
peas	2	4
spinach	4	1
lima beans	0	1

[1] 20 observations for pre-training and 20 for post training.

Storage Before Cooking

All frozen vegetables were transported from the central kitchen, school A, to the other four schools one day before cooking and serving. The researchers arrived at the school kitchen one and one-half hours before lunch was served. Storage place of pans of vegetables, when the researcher arrived, is shown on Table 5. Prior to training, panned vegetables were most frequently stored in the steamer, which generally was not heated, or on the counter. During training sessions, the recommendation was made to store all pans of vegetables in the refrigerator until production time. After training, storage of pans of vegetables in steamers decreased markedly in all schools except A which showed an increase. Although most schools changed their storage places after training, only school C followed the recommendation for refrigerator storage.

Pan Size

Table 6 shows variation in use of full and half size counter pans, two, four, or six inches deep, for cooking vegetables. During the training sessions, the use of two inch full or half size counter pans, as recommended by the manufacturers of the steamers, was emphasized.

Schools B and E used two inch pans exclusively after training. The steamer at school D could only take half pans and to prepare the quantity of vegetables needed, four or six inch pans were required.

Table 5. Storage place of filled pans before cooking[1] by number of pans pre- and post training[2]

storage place before cooking	schools A	B	C	D	E
	← number of pans →				
pre-training					
steamer	6	0	6	1	7
counter	2	8	2	23	6
refrigerator	1	0	3	0	0
freezer	1	0	0	0	0
post training					
steamer	11	0	0	0	1
counter	0	8	1	19	15
refrigerator	2	0	14	0	0
freezer	1	0	0	0	0

[1] Observations were made one and one-half hours before cooking vegetables.

[2] Four observations at each school for pre-training and four for post training.

Table 6. Pan size variations by schools, pre- and post training[1]

pan sizes	schools				
	A	B	C	D	E
	← number of pans →				
pre-training					
two inch full[2]	2	4	11	0	11
two inch half[3]	0	0	0	0	0
four inch full	6	4	0	0	2
four inch half	0	0	0	1	0
six inch full	2	0	0	0	0
six inch half	0	0	0	23	0
post training					
two inch full	1	8	12	0	16
two inch half	0	0	3	0	0
four inch full	13	0	0	0	0
four inch half	0	0	0	19	0
six inch full	0	0	0	0	0
six inch half	0	0	0	0	0

[1] Four observations at each school for pre-training and four for post training.

[2] Full pan = 12 × 20 inches.

[3] Half pan = 12 × 10 inches.

Time/Temperature Relationships

All schools had two service periods except school D which had three. Data from the third service at school D were omitted. All pans of cooked vegetables were identified by number, and temperatures were recorded at three stages of the service process: end of production, start of service, and end of service. Temperatures were obtained by four observations at each school for the indicated number of pans.

Temperatures at Three Stages

Pre-training. Table 7 shows the mean temperature of the vegetables at end of production, start of service, and end of service for each school prior to training. Temperatures are the means for vegetables from the first and second service. The temperature of the vegetables in all five schools was above the recommended level of 60°C at the end of production (42). An average decline of 10°C was shown from end of production until start of service which resulted in serving temperatures below 60°C in two of the five schools. Temperatures continued to decrease during service in all schools but one, which might be attributed to other uses of the cafeteria precluding heating of steamtables until five minutes before service. In school C where the vegetable was served in the salad bar along with cold food items, a 20°C decrease during service was shown.

These results are similar to those of Rieley et al. (7). Temperature of chicken nuggets, potato logs, and broccoli at the

Table 7. Mean temperatures of vegetables for first and second services[1] from end of production through end of service pre- and post training

school	data collection	N[2]	temperatures		
			end of production	beginning of service	end of service
			← mean temperatures (°C)	standard error →	
A	pre-training	8	65 ±1.33	57 ±1.94	49 ±1.83
	post training	14	71 ±1.85	67 ±2.66	58 ±1.22
B	pre-training	8	75 ±2.42	65 ±1.78	61 ±2.26
	post training	8	68 ±1.72	65 ±1.67	62 ±1.69
C	pre-training	10	73 ±2.82	61 ±3.11	41 ±1.71
	post training	14	65 ±1.70	58 ±1.86	57 ±1.03
D	pre-training	22	68 ±1.45	52 ±1.15	49 ±1.30
	post training	19	72 ±1.70	61 ±1.70	57 ±1.65
E	pre-training	13	67 ±4.45	61 ±2.27	54 ±2.29
	post training	15	67 ±2.60	59 ±1.43	54 ±1.51

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[1] Mean temperatures for combined first and second services.

[2] Number of pans of vegetables prepared during observation period (four days).

beginning and end of service in the satellite system were consistently at or below the standard of 60°C.

Post training. Table 7 also shows mean temperatures of vegetables after training. As in pre-training observations, temperatures at end of production were above the recommended level in all schools. The serving temperatures increased in two of the schools after training, two served vegetables below 60°C, and one remained the same. Also, temperatures declined to below 60°C at the end of service in all schools.

Table 8 shows mean serving temperatures of the vegetables at the beginning of the first and second service in all five schools. The results indicated that, in general, training did not produce significant improvement in serving temperatures for either service. However, analysis of serving temperatures within each school indicated improvement in school A for the first service and school D for the second.

Holding Time

Pre-training. Holding time is defined as the time elapsed from end of production until start of service. Before training, mean holding time ranged from 43 to 71 minutes for first service and from 31 to 87 minutes for second service (Table 9). In many schools, vegetables for both services were prepared at the same time. Four observations of holding time were made at each school for the indicated number of pans.

These findings are similar to those reported by Johnson (6) in which holding time from end of production to end of service for four

Table 8. Mean serving temperatures of vegetables at beginning of service for first and second services pre- and post training

school	data collection	1st service[2]		2nd service[3]		
		N[1]	temperature (°C)	N[1]	temperature (°C)	
			mean standard error		mean standard error	
A	pre-training	6	58.3 ± 1.8	6	57.5 ± 2.17	
	post training	6	68.0 ± 4.84	5	64.6 ± 4.14	
B	pre-training	8	63.5 ± 2.87	8	66.3 ± 1.88	
	post training	4	61.5 ± 2.31	8	66.3 ± 2.41	
C	pre-training	4	59.5 ± 4.29	7	61.0 ± 4.08	
	post training	10	58.5 ± 2.30	7	53.1 ± 3.36	
D	pre-training	12	49.8 ± 0.90	7	48.0 ± 2.67	*
	post training	9	58.11 ± 2.07	8	65.0 ± 3.55	
E	pre-training	8	63.6 ± 4.07	9	59.8 ± 2.01	
	post training	8	58.6 ± 2.24	10	58.5 ± 1.59	

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[1] Number of pans of vegetables prepared during observation periods (four days).

[2] Analysis of overall effect of training on serving temperature of first service $F = 34.12$ $p = .44$.

[3] Analysis of overall effect of training on serving temperature of second service $F = 38.88$ $p = .109$

*$p < .05$

Table 9. Holding time of vegetables for first and second services pre- and post training

school	data collection	1st service[2]			2nd service[3]		
		N[1]	minutes		N[1]	minutes	
			mean standard error			mean standard error	
A	pre-training	6	58.2 ± 5.62		6	75.3 ±13.51	***
	post training	6	41.2 ± 6.08		5	15.2 ± 1.83	
B	pre-training	8	43.3 ± 3.80		8	65.5 ± 3.82	**
	post training	4	31.0 ± 0.58		8	35.0 ± 8.14	
C	pre-training	4	71.3 ± 2.14	***	7	87.0 ± 8.78	***
	post training	10	40.9 ± 2.89		7	44.86 ± 8.32	
D	pre-training	12	66.0 ± 1.74		7	31.3 ±14.86	
	post training	9	61.8 ± 3.89		8	35.1 ±10.63	
E	pre-training	8	46.9 ±11.23		9	60.1 ±10.35	
	post training	8	53.6 ± 4.87		10	48.9 ± 5.56	

[1] Number of pans of vegetables prepared during observation period (four days).

[2] Analysis of overall effect of training on holding time during first service F = 39.25 p = .0037.

[3] Analysis of overall effect of training on holding time during second service F = 44.28 p = .00001.

$^{**}p < .01$ $^{***}p < .001$

vegetables ranged from 60 to 165 minutes at the satellite schools and from 25 to 90 minutes at the on-site preparation schools. Rieley et al. (7) compared holding time of conventional, satellite, and satellite with finishing systems and reported holding times for food items in the satellite with finishing kitchens were as long as those in complete satellite systems. The holding time for broccoli from the finishing kitchens was as high as 130 minutes.

Post training. Usually, training significantly improved holding time for the first service (Table 9). All schools, except E, showed an average of 20 minutes decrease in holding time for the first service. Holding time after training ranged from 31 to 62 minutes. The 30 minute decrease in school C was highly significant ($p < .001$).

Holding time for the second service decreased significantly ($p < .00002$). The mean holding time for the second service ranged from 15 to 49 minutes post training. Schools A, B, and C showed a highly significant reduction in holding time post training. Little difference was noted at school D because batch cooking was being used during the pre-training phase.

Positive Reinforcement

One of the research objectives was to assess the value of positive reinforcement on the performance of cooks. Schools B, C, and D were randomly selected for their cooks to receive positive reinforcement.

Because of the statistical limitations of the small number of schools, the positive reinforcement was not demonstrably effective.

Also, the cook in one of the schools selected to receive positive reinforcement from a superior did not receive it. In another school not selected, the vegetable cook received praise from the school principal and students. An article was written by the students for the school newsletter and local newspaper recognizing the foodservice employees for their effort and work.

SUMMARY AND CONCLUSIONS

A two part research project based upon conclusions of previous studies by Johnson and by Rieley was conducted. Results of the Johnson study (6) indicated that long holding time for both vegetables and entrees affects quality of food. A sequel to the Johnson study by Rieley et al. (7) suggested variations in food quality may result from improper preparation techniques and indicated further research is needed to determine the probability of training to improve techniques and increase quality of food. The objectives of part one were to assess time/temperatures and holding times of cooked vegetables in five elementary schools, to conduct training programs on batch cooking of vegetables, and to assess the effectiveness of training on time/temperature relationships and holding times. The objectives of part two were to assess the influence of training on plate waste, to compare student ratings of cooked vegetables before and after training of cooks, and to determine if quality characteristics, as measured by a professional sensory panel, are affected by proper training in vegetable preparation techniques (8).

Part one of the study was conducted in two phases. In Phase I, vegetable preparation was observed in five elementary schools. During each of four visits to the schools, procedural schedules of the cooks were observed to determine the possibility of corrective measures. Times and temperatures were recorded on an observation form at start of cooking, end of cooking, start of service, and end of service. Holding time for a pan of vegetables was determined as time elapsed from end of production until time of service. Analysis of data in Phase I indicated serving temperatures at most of the schools were below 60°C, and holding time ranged from 5 to 120 minutes, confirming the findings of previous studies.

A training program was developed in Phase II which consisted of four sessions: a group in-service, two on-site, and a follow-up. The group in-service session was conducted for all school foodservice employees in the district. The on-site training sessions were for employees from the five participating elementary schools. Some of the topics included in the training were: summary of previous studies, data on time/temperature relationships and holding time of cooked vegetables, principles of vegetable quality, and principles of batch cooking. As in Phase I, data on time/temperature relationships and holding time were recorded to assess the effectiveness of training.

Results indicated that pre- and post training mean temperatures of the vegetables in all five schools were above the recommended level of 60°C at the end of production. A steady decline in temperature, however, was shown from end of production until start of service which resulted in serving temperatures below 60°C. The decline might be attributed to other uses of the cafeteria precluding heating of steamtables until five minutes before service.

Post training data showed that temperature at the end of production, as in pre-training, was above the recommended level in all schools but one. Little difference in the decline of temperature during service was noted. The results indicated that, in general, training did not produce significant improvements in serving temperatures. Analysis of serving temperatures within each school, however, indicated improvement in two schools.

Four observations of holding time were made at each school pre- and post training. All schools, except one, showed an average of 20 minutes decrease in holding time for the first service. A highly significant decrease in holding time was observed in most of the schools. Little difference was noted in one of the schools because batch cooking was being used during the pre-training phase.

A sequel to the research was assessment of the value of positive reinforcement on the performance of cooks from three randomly selected schools. Because of statistical limitations of the small number of schools, positive reinforcement effects could not be evaluated.

Although training was very effective in reducing holding time, it did not result in comparable improvement in serving temperatures. The concluding recommendation is that a regular training program with subsequent monitoring of cooks' performance be instituted.

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APPENDICES

APPENDIX A

Letter to Dean of College of Education and to Superintendent (Phase I)

(KSU Letterhead)

November 8, 1985

Dr. David R. Byrne
Dean, College of Education
Blumont Hall, Room 006
Kansas State University
Manhattan, kS 66502

Dear Dr. Byrne:

We are seeking your approval of a research project funded by the Agricultural Experiment Station. The study, which will be conducted through the department of Dietetics, Restaurant, and Institutional Management will focus on the preparation and acceptance of vegetables served in several of the Manhattan schools. Previous studies conducted in these schools have indicated a high degree plate waste of vegetables. In our proposed study we plan to explore factors which might contribute to the acceptability and consumption of vegetables. Mrs. Sue Greig, District Director of Foodservice, has encouraged us to proceed with the study and has shown support for the project.

Woodrow Wilson, Northview, Amanda Arnold, Lee, Theodore Roosevelt, and Eugene Field have been selected as the proposed sites for the study. Several types of data will be collected. Cooks in each kitchen will be observed during actual meal preparation on several occasions. Information on preparation procedures and time-temperature relationships will be recorded. In addition, several quality characteristics that may affect acceptability will be assessed by both a professional sensory panel and the upper level elementary students. Plate waste will be observed by the research team at the conclusion of lunch time. Following lunch in the cafeteria, students will be asked to complete a short evaluation form on the vegetable they were served, which should not take more than five minutes.

We have discussed the proposed project with the College of Human Ecology subcommittee on research involving human subjects. The focus of this research is considered to be exempt from Human Subject review as stated in Federal regulation 45 CFR 46.

We plan to begin observations of food preparation in the school foodservice kitchens in December, 1985, and will continue through January. Data from the students and the sensory panel will be collected in January.

We will appreciate your early consideration of this project. Your approval is necessary before we seek permission from Dr. Hal Rowe, Superintendent of USD 383. We would like to present the research project to the Manhattan elementary school principals at their meeting November 27, 1985. If you have any questions, please contact us at 532-5521.

Thank you for taking time to review this project.

Sincerely,

Almaz Rufael
Almaz Rufael
Graduate Research Assistant

Karla Sue Devan
Karla Sue Devan
Graduate Student

Mary Gregoire
Mary Gregoire, Ph.D. R.D.
Assistant Professor

cc Dr. Hal Rowe
Mrs. Sue Greig
Dr. Marian Spears

(KSU Letterhead)

November 15, 1985

Dr. Hal Rowe, Superintendent
Unified School District 383
2031 Poyntz
Manhattan, KS 66502

Dear Dr. Rowe:

In keeping with the agreement between the Manhattan Public Schools and the College of Education, we have screened the enclosed proposal by Dr. Mary Gregoire and Almaz Rufael to conduct research in U.S.D. 383. The proposal seems to merit your consideration. It appears the potential outcomes are likely with the investment of time by the district. We are forwarding it to you for your action. The proposal has been approved by an appropriate Committee on Research Involving Human Subjects within the University and we see no harm arising as a result of the study.

Sincerely,

David R. Byrne
Dean

DRB:llb

Enclosure

cc: M. Gregoire
A. Rufael ✓

(KSU Letterhead)

November 13, 1985

Dr. Hal Rowe
Superintendent of USD 383
2031 Poyntz
Manhattan, Kansas 66502

Dear Dr. Rowe:

The Department of Dietetics, Restaurant and Institutional Management at Kansas State University has requested an approval from Dr. David Byrne, Dean of the College of Education for a vegetable acceptability research project we propose conducting in the elementary schools in Manhattan. A copy of the letter sent to Dr. Byrne is enclosed for your information. Pending the approval of the project, we would like to present the study to the elmentary school principals at their meeting on November 27, 1985.

Thank you for your cooperation.

Sincerely,

Almaz Rufael
Almaz Rufael
Graduate Research Assistant

Karla Sue Devan
Karla Sue Devan
Graduate Student

Mary Gregoire
Mary Gregoire, Ph.D. R.D.
Assistant Professor

APPENDIX B

Letter to Dean of College of Education and to Superintendent (Phase II)

(KSU Letterhead)

January 20, 1986

Dr. David R. Byrne
Dean, College of Education
Bluemont Hall, Room 006
Kansas State University
Manhattan, Kansas 66502

Dear Dr. Byrne,

We are seeking your approval for the continuation of a research project funded by the Agricultural Experiment Station. The study, which will be conducted through the department of Dietetics, Restaurant and Institutional Management, will involve the training of school foodservice employees on the techniques of batch cooking of vegetables as a means of improving the quality of the vegetables served. Mrs. Sue Greig, District Director of Foodservice, is supportive of the proposed training and has encouraged us to proceed with the study.

The continuation of our previous project, outlined in a letter to you on November 8, is requested based on the data we have collected. Several factors which might contribute to the acceptability and consumption of vegetables have been determined. We have been observing the preparation of vegetables in five of the elementary school kitchens and have been recording time-temperature relationships. These data and the results from a previous study indicate that vegetables are often prepared early in the day and held for extended periods before service. In many cases the temperature and quality of the vegetable declines during the holding period.

Our research plan is to conduct both group and individual training sessions on batch cooking of vegetables with the cooks at Amanda Arnold, Eugene Field, Marlatt, Northview, and Woodrow Wilson schools. The desired outcomes from the training program will be shortened holding time of vegetables and improved temperature and quality of vegetables at time of service. In order to evaluate the success of the training program, we propose to again collect observational data in the kitchens, sensory panel and student evaluations, and plate waste data.

We have discussed the proposed project with the College of Human Ecology subcommittee on research involving human subjects. The focus of this research is considered to be exempt from Human Subject review as stated in Federal regulation 45 CFR 46.

We would like to complete the project before the spring semester ends, thus if the study is approved, we plan to begin the training sessions in late February and will continue the training in March. The collection of the post-training information, which includes the kitchen observations, student and sensory panel evaluations and plate waste assessments, would occur in April.

We will appreciate your early consideration of this project. Your approval is necessary before we can seek approval from Dr. Hal Rowe, Superintendent of USD 383 and we would like to gain his approval for the project before the end of January. If you have any questions, please contact us at 532-5521.

Thank you for taking time to review this project.

Sincerely,

Almaz G. Rufael

Almaz G. Rufael, R.D.
Graduate Research Assistant

Karla Devan

Karla Devan
Graduate Student

Mary B Gregoire

Mary B. Gregoire, Ph.D., R.D.
Assistant Professor

cc Dr. Hal Rowe
Mrs. Sue Greig
Dr. Marian Spears

(KSU Letterhead)

January 21, 1986

Dr. Hal Rowe
Superintendent of USD 383
2031 Poyntz
Manhattan, Kansas 66502

Dear Dr. Rowe,

We are requesting your approval for continuation of the vegetable acceptability study we have been conducting in five of the elementary schools. Although we have not completed the data collection in all schools, the data which has been collected this month has confirmed the results of a previous study completed last spring, both indicating that the vegetables are often prepared in advance of service and held for various lengths of time. In many cases the quality and temperature of the vegetable declines during the holding period. We believe these factors have an impact on the acceptability of the vegetables when they are served.

We have proposed to Mrs. Sue Greig that a training program on batch cooking of vegetables may be benefical to the USD 383 foodservice program and that we would like to conduct the training sessions with the cooks. Mrs. Greig has been supportive of our proposal and has encouraged us to continue with the project.

We have written to Dr. Byrne, Dean of the College of Education, for his approval of the project. A copy of that letter is enclosed.

The training program we propose would include both group and individual training. The group training session would be offered to all of the cooks in the USD 383 foodservice. The individual training would only be done with the cooks from the five elementary schools that are currently involved in our study: Amanda Arnold, Eugene Field, Marlatt, Northview, and Woodrow Wilson.

The desired outcomes from the training program would be shortened holding time of vegetables and improved temperature and quality of vegetables at the time of service. In order to evaluate the success of the training program we propose to again collect observational data in the kitchens, sensory panel and student evaluations, and plate waste data.

Our research plan, if this proposal is accepted, is to begin the training in late February and continue it through March. The post-training information (kitchen observations, student and sensory evaluations) would be collected in April. The observation of vegetable production in the kitchens and the recording of time-temperature relationships would occur four times in each kitchen. Student and sensory panel evaluations and plate waste data would be collected on two non-consecutive days in each school.

Thank you for your support of our research. We would like to have your approval by February 4, if possible, so that we can present our plan to the cook managers at their meeting on that day. If you have any questions on this proposed continuation of the project, please contact one of us at 532-5521.

Sincerely,

Almaz Rufael
Almaz G. Rufael, R.D.
Graduate Research Assistant

Karla Sue Devan
Karla Sue Devan
Graduate Student

Mary B Gregoire
Mary B. Gregoire, Ph.D., R.D.
Assistant Professor

cc Mrs. Sue Greig
Dr. Marian Spears

(KSU Letterhead)

January 21, 1986

Dr. Hal Rowe, Superintendent
Unified School District 383
2031 Poyntz
Manhattan, KS 66502

Dear Dr. Rowe:

In keeping with the agreement between the Manhattan Public Schools and the College of Education, we have screened the enclosed request submitted by Dr. Mary Gregoire and Almaz Rufael to continue research in U.S.D. 383. The proposal seems to merit your consideration. We are forwarding it to you for your action. The proposal has been approved by an appropriate Committee on Research Involving Human Subjects within the University and we see no harm arising as a result of the study.

Sincerely,

David R. Byrne
Dean

DRB:llb

Enclosure

cc: M. Gregoire ✓
    A. Rufael ✓

APPENDIX C

Observation Form

SCHOOL: ____________ DATE: ____________

PAN #____________ TYPE VEGETABLE____________ LOCATION: ____________

OBSERVATION

EVENT	TIME	TEMP
START COOKING		
FINISH COOKING		
START OF SERVICE		
END OF SERVICE		
HOW LONG COOKED?		

HOW MANY BOXES COOKED?____________

AMT OF VEG LEFT IN PAN________SERVINGS

COMMENTS:

INFORMATION

A. EQUIPMENT USED TO COOK VEG: ____________

B. SIZE OF PAN: ____________

C. NUMBER SERVED: ____________

D. SEQUENCE OF EVENTS:

1. BEFORE: ____________
2. DURING: ____________
3. AFTER: ____________

OBSERVATION (CONT'D)			INFORMATION (CONT'D)
	TIME	TEMP	
START OF SECOND SERVICE			TIMEHELD: 1. PRIOR TO SERVICE____________
END OF SERVICE			2. BETWEEN SERVICE____________

ADDITIONAL COMMENTS:

APPENDIX D

Data Collection Schedule (Phase I)

(KSU Letterhead)

Data Collection Schedule

Date	Event	Location
December 3	Meet with school food service employees	Education building
December 6	Test observation instrument	School E[2]
December 18	Train graduate students in data collection	Kansas State University
January 7	Observation of production techniques	Schools A[1] and B[2]
January 9	Observation of production techniques	Schools A and A
January 10	Observation of production techniques	Schools A and E
January 14	Meet with sensory panel	Kansas State University Quantity Food Laboratory
	Observation of production techniques	Schools A and
January 15	Train graduate students in data collection	Kansas State University Quantity Food Laboratory
January 16	Observation of production techniques	School E
January 17	Collection of data from sensory panel and students	Schools A, B, C[1], D[1], and E
	Observation of production techniques	Schools B and D
January 21	Observation of production techniques	Schools A and C

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1. Conventional.
2. Satellite with finishing kitchen.

January 23	Observation of production techniques	Schools C and D
January 24	Observation of production techniques	School B
January 28	Observation of production techniques	Schools D and E
January 30	Observation of production techniques	Schools E
January 31	Collection of data from sensory panel and students	Schools A, B, C, D, and E
	Observation of production techniques	Schools C and D

APPENDIX E

Letter and Proposed Training for School Foodservice Employees

(KSU Letterhead)

January 28, 1986

To: S. Greig

From: A. Rufael
K. Devan
M. Gregoire

Attached is a copy of the proposed training on vegetable cookery for school foodservice employees. We would like to offer both the group and on-site training for credit. Would you please review the proposed training and indicate to us how much credit could be offered for the group sessions and for the on-site training. We will present the information of the proposed training at the February 4 manager's meeting.

Thank you for your assistance.

(KSU Letterhead)

Proposed Training of School Foodservice Personnel

date	no. of sessions	content
February 18 (group training)	1	1-hour session for all cooks on cooking techniques for preparing vegetables; to be held at the education center
February 20 - March 27 (on-site training)*	1	1/2-hour session at each school to review procedures
	2	2 1/2 to 3-hour sessions, working with the vegetable cook at each school on actual vegetable preparation
	1	2 1/2 to 3-hour session at each school to follow-up on training and answer any questions

* On-site training at the following schools:

A, B, C, D, and E

Objectives:

After attending the group training session, the cooks will:

- Have an understanding of nutrient loss which occurs in vegetables when they are held for extended periods of time.
- Recognize importance of checking serving temperature of vegetables.
- Be aware of cooking techniques which could help reduce holding time of vegetables.

After completing the on-site training sessions, the cook will:

- Utilize cooking techniques which will reduce holding time of vegetables.
- Serve vegetables which are at a temperature above 140°F.

Dates of On-site Training

February 20 & 21	E
February 25 & 27	A and B
March 4 & 6	C and D

Note: Almaz and Karla will make an appointment with the vegetable cook and the manager at each school to review procedures prior to the above date of on-site training.

Training Follow-up

March 21	E and D
March 25	A and B
March 27	C

APPENDIX F

Content of Training

(KSU Letterhead)

COOKING VEGETABLES TO SERVICE: PRINCIPLES AND TECHNIQUES

Continuing Education Classes
for
School Foodservice Personnel

Group Training

Date: February 18 Time: 2:00 p.m.

Location: Education Center

Audience: We request that the vegetable cook and manager from schools A, B, C, D, and E plan to attend. All cooks and managers from the other schools are welcome to attend.

Content: This session will address several aspects related to the nutritional and sensory quality of vegetables. Preparation techniques, which can help maintain the nutritional quality of vegetables, will be discussed.

Continuing Education Credit Hours Requested: 1 hour

Individualized Training

Date:	Location:
February 20 & 21	E
February 25 & 27	A and B
March 4 & 6	C and D

Audience: Vegetable cooks at each of the schools listed above.

Content: These sessions will focus on helping cooks prepare vegetables using the equipment in their own kitchens. We realize that each kitchen is different, thus Almaz and Karla will work with each vegetable cook to customize vegetable preparation procedures for their school. The goal of the sessions will be to help cooks prepare the most nutritious product possible.

Note: Almaz and Karla will make an appointment with the vegetable cook and manager at each school to review procedures prior to the above date of the on-site training.

Training Follow-up

Date:	Location:
March 21	D and E
March 25	A and B
March 27	C

Content: Almaz and Karla will return to each school to review the vegetable preparation techniques and allow cooks the opportunity to have any questions answered.

Continuing Education Credit Hours Requested: 6 - 8 hours

APPENDIX G

In-service Training Outline

KANSAS STATE UNIVERSITY
Department of Dietetics, Restaurant & Institutional Management

COOKING VEGETABLES TO SERVICE: PRINCIPLES AND TECHNIQUES

1. Results of Research
   - Johnson study
   - Rieley study
   - Current project

2. Factors Affecting Vegetable Quality
   - Nutritional
   - Time-Temperature Relationships

3. Principles of Vegetable Preparation
   - Cook as close to service as possible
   - Use 2-inch perforated pans
   - Limit to five pounds of vegetable per pan
   - Defrost vegetables
   - Have seasonings ready
   - Do not mix pans of vegetables
   - Check temperature
   - Preheat steamer
   - Do not overload steamer

4. Example

- Number of servings of vegetables needed: 200
- Size of serving: 2 ounce (1/4 cup)
- Pounds of vegetables needed ________________

First Line

- Number of servings of vegetable needed: 120
- Pounds of vegetables needed ____________________
- If 5 pounds of vegetable per pan, number of pans needed ____________________

Second Line

- Number of servings of vegetable needed: 80
- Pounds of vegetables needed ___________________
- If 5 pounds of vegetable per pan, number of pans needed ___________________

APPENDIX H

Data Collection Schedule (Phase II)

(KSU Letterhead)

Data Collection Schedule

Date	Event	Location
April 8	Observation of production techniques	A[1] and B[2]
April 10	Observation of production techniques	A and B
April 15	Observation of production techniques	A and E[2]
April 17	Observation of production techniques	A and C[2]
April 18	Observation of production techniques	D[1] and E
	Collection of data from sensory panel and students	A, B, C, D, E, and E
April 24	Observation of production techniques	C and E
April 25	Observation of production techniques	C and D
April 29	Observation of production techniques	B and D
May 1	Observation of production techniques	B and E
May 2	Observation of production techniques	C
	Collection of data from sensory panel and students	A, B, C, D, and E
May 6	Observation of production techniques	E

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1. Conventional.
2. Satellite with finishing kitchen.

EVALUATION OF A VEGETABLE PREPARATION TRAINING PROGRAM: PART I: DEVELOPMENT OF TRAINING PROGRAM AND ASSESSMENT OF TIME-TEMPERATURE DATA

by

ALMAZ G. RUFAEL

B.S., University of Nebraska-Lincoln, 1984

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Hotel, Restaurant, Institution
Management, and Dietetics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1987

ABSTRACT

One of the major goals of school foodservice is to provide high quality food. Quality is essentially a function of time/temperature relationships from production to service. Holding time is one of the temperature losers in prepared food. Reduction in holding time and other sources of temperature loss can best be achieved through proper training of employees.

A two part study was conducted in five elementary schools in a medium sized midwestern city. The objectives of Part I were to assess temperatures and holding times of cooked vegetables at the five elementary schools, to conduct a training program on batch cooking of vegetables, and to assess the effectiveness of training on temperature and holding time of cooked vegetables. The study was conducted in two phases. In Phase I, the quality of frozen vegetables currently being served was assessed. Based upon the findings, Phase II was developed to train school foodservice cooks on correct vegetable preparation methods.

In Phase I, vegetable preparation was observed four times in each of the five schools. Times and temperatures were recorded at start of cooking, end of cooking, start of service, and end of service. Holding time for a pan of vegetables was determined as the time elapsed from end of production until time of service.

Analysis of the data indicated serving temperatures at most of the schools were below 60°C and holding time ranged from 5 to 120 minutes. This confirmed the findings of previous studies by Johnson and Rieley in other schools. A training program was designed as a remedial measure. A group in-service training session was presented to all foodservice employees in the district. Employees from the five participating schools received two additional on-site training sessions and a follow-up. As in Phase I, four observations of time/temperature relationships and holding time were made at each school post training. Data showed that serving temperatures after training increased in three of the schools. A highly significant decrease in holding time was observed in most of the schools. Positive reinforcement on performance was given to cooks in three randomly selected schools. Due to the statistical limitations of the small number of schools, positive reinforcement was not demonstrably effective. The concluding recommendation is that a regular training program with subsequent monitoring of cooks' performance be instituted.